

SEVEN NEW SPECIES OF THE INDO-PACIFIC GENUS *EVIOTA* (PISCES: GOBIIDAE)

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Abstract.—Seven new species of gobiid fishes of the genus *Eviota* Jenkins from Indo-Pacific marine waters are described as: *E. albolineata* (a member of Group I, Lachner and Karnella 1980:113); *E. japonica*, *E. latifasciata*, *E. punctulata* (Group II); *E. cometa*, *E. sigillata* (Group III); and *E. sparsa* (Group VII, the characters of which are discussed herein). The available evidence does not indicate that these species form a natural group. A table of characters for Groups I, II, III, and VII is given. Illustrations of the seven new species and a table of pertinent characters and meristics are provided.

As part of our continuing study of the systematics and zoogeography of the gobiid genus *Eviota* Jenkins (Lachner and Karnella 1978, 1980; Karnella and Lachner 1981), we present descriptions of seven new species. In our earlier study (1980:113) we discussed six species groups of *Eviota*. We herein define a seventh species group, and relate each of the new species to Groups I, II, III, or VII. A summary of species group characters is presented in Table 1.

The new species and their species group allocations are as follows: *Eviota albolineata*, Group I (containing 17 nominal species); *E. japonica*, *E. latifasciata* and *E. punctulata*, Group II (11 nominal species); *E. cometa* and *E. sigillata*, Group III (7 nominal species); and *E. sparsa*, Group VII (2 species, one to be described subsequently). The salient characters of the seven new species are given in the diagnostic accounts under each species, and some are summarized in Table 2.

Methods

The methods of obtaining counts and measurements and the presentation of these data, as well as the description of the cephalic sensory pore and cutaneous papillae systems, follow that of Lachner and Karnella (1978, 1980), and Karnella and Lachner (1981) with the following modifications:

1. "Pelvic fin membrane" refers to the membrane connecting the third and fourth rays of the pelvic fin. It is considered to be reduced when its length does not extend to the first branch of the fourth pelvic fin ray and to be well developed when it exceeds that point (Fig. 1, Lachner and Karnella 1980).

2. "Postanal midline spots" refers to the dark spots, composed at least in part of subcutaneous pigmentation, that occur along the posteroventral midline of the trunk. These spots begin at, or just posterior to, the origin of the anal fin, and extend to a vertical drawn 2 to 3 scale rows anterior to the hypural joint, otherwise referred to as the "midcaudal peduncle." There are usually 4 to 6 postanal midline

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Table 1.—Characters distinguishing four species groups of *Eviota*.

Characters	Groups			
	I	II	III	VII
Cephalic sensory pore pattern	1	2	2	5
Vertebrae	26	26	25	26
Some pectoral fin rays branched	yes ¹	yes	no	yes
Male genital papilla	nonfimbriate	nonfimbriate, fimbriate or cup-shaped	nonfimbriate	nonfimbriate
Pelvic fin membrane	reduced to well developed	reduced	reduced to well developed	well developed
Length of fifth pelvic fin ray relative to fourth fin ray	absent to 2/10	absent to 1/10	1/10 to 5/10	6/10–9/10
Spinous dorsal fin elongation	Yes or no	yes or no	yes	yes

¹ Except some specimens of *E. monostigma* and *E. pseudostigma*.

spots. An additional spot, usually smaller and less intense, may occur more posteriorly, near the insertion of the ventral procurrent rays. This spot is not included when counting the postanal midline spots.

3. "Midcaudal peduncle spot" refers to a dark spot on the caudal peduncle, usually centered on the lateral midline, 2 to 3 scale rows anterior to the insertion of the caudal fin. The spot may be composed entirely of subcutaneous pigment or may be a combination of surface and subcutaneous pigmentation. It is in line with the last subcutaneous trunk bar when a series of trunk bars occurs.

Three cephalic sensory pore patterns are found in the species described in this paper. Pore pattern 1 represents the full complement of sensory pores for the genus *Eviota* and includes the paired nasal (NA) pores, the single anterior interorbital (AITO) and posterior interorbital (PITO) pores, the paired supraotic (SOT), anterior otic (AOT), and intertemporal (IT) pores, as well as two pairs, an upper and lower, of preopercular (POP) pores (Fig. 4, Lachner and Karnella 1980). Pore pattern 2 lacks only the IT pores, and pore pattern 5 lacks the IT and both pairs of POP pores. Cutaneous papillae patterns A, B and B-1 (Lachner and Karnella 1980:7) correspond to pore patterns 1, 2 and 5, respectively.

Presentation of material examined for holotypes and paratypes is of the following format: catalog number, size range, abbreviated locality data, depth of capture, collector and field number. Non-type material is summarized by geographic locality rather than listed by individual museum lot.

Abbreviations: the following museum acronyms are used to designate institutions and collections cited:

- AMNH American Museum of Natural History, New York
 AMS Australian Museum, Sydney
 ANSP Academy of Natural Sciences, Philadelphia
 BPBM Bernice P. Bishop Museum, Honolulu

Table 2.—Summary of diagnostic characters of seven new species of *Eviota*. (Pectoral fin rays are numbered sequentially from 1 to 18, beginning with uppermost ray. Figures given refer to numbered fin rays, and list the maximum branching for each species.)

Characters	Species						
	<i>albulineata</i>	<i>japonica</i>	<i>laifasciata</i>	<i>punctulata</i>	<i>cometa</i>	<i>sigillata</i>	<i>sparsa</i>
Group (after Lachner and Karnella 1980)	I	II	II	II	III	III	VII
Cephalic sensory pore pattern	1	2	2	2	2	2	5
Number of vertebrae	26	26	26	26	25	25	26
Dorsal/anal fin ray formula	9/8	9/8	8/8	9/8	9/8 or 8/7	9/8 or 8/7	9/8
Spinous dorsal fin elongation	uncommon, males only	well developed, both sexes	none	uncommon, males only	well developed, males only	well developed, both sexes	uncommon
Limits of pectoral fin ray branching	4–18	8–17	10–18	8–16	none	none	8–17
Length of fifth pelvic fin ray relative to fourth fin ray	1/10–2/10	1/10–2/10	rudiment	1/10–2/10	1/10	1/10–2/10	6/10–8/10
Development of pelvic fin membrane	well developed	reduced	reduced	reduced	reduced to well developed	well developed	well developed
Number of branches on fourth pelvic fin ray	6–12	8–16	7–11	8–18	4–9	3–7	3–5
Number of postanal midline spots	undeveloped	6	undeveloped	6	undeveloped (or 5)	7	5

CAS	California Academy of Sciences, San Francisco
FMNH	Field Museum of Natural History, Chicago
ROM	Royal Ontario Museum, Toronto, Canada
RUSI	Rhodes University, J.L.B. Smith Institute of Ichthyology, Grahamstown, South Africa
USNM	Former United States National Museum, now National Museum of Natural History (NMNH), Smithsonian Institution, Washington, D.C.
WAM	Western Australian Museum, Perth
YCM	Yokosuka City Museum, Yokosuka, Japan

Eviota albolineata, new species

Figs. 1–2

Material examined.—998 specimens from numerous localities, ranging from the east coast of Africa to the Tuamotu Archipelago; total size range 7.7–24.7; gravid females 11.1–21.1.

Holotype: USNM 227140, (22.2), male; Tahiti, shallow patch south of Tapueraha Pass, 0–3.0 m, 21 Apr 1970, C. L. Smith, S70-45.

Paratypes: TAHITI: AMNH 43023, 2 (16.2, 21.3); same data as holotype. AMNH 43022, 1 (16.4); north side of Passe Tiamahana, 10.7–13.7 m, S70-11. AMNH 43025, 1 (18.9), off Papeari, 0–2.1 m, S70-53. AMNH 43024, 13 (15.6–19.3); south of Tapueraha reef, 0–3.6 m, S70-41. USNM 227166, 11 (14.1–22.0); south of Tapueraha, 0–7.6 m, S70-44. CAS 52829, 4 (16.4–21.6); off Papeari, 6.1–10.7 m, S70-51. BPBM 29191, 1 (19.4); off Papeari, 0–3.6 m, S70-55. AMS I.24025-001, 6 (16.0–19.4); south of Tapueraha Pass, 0–2.4 m, S70-43. ANSP 151994, 6 (16.9–19.8); same data as previous. CAS 48471, 4 (14.4–19.5); Atimaono, Teauaraa Pass, 0.9–13.7 m, sta 18, GVF Reg. 1350. HUAHINI NUI: AMNH 43034, 45 (13.2–20.9); 0.5 mi. south of Fare, 10.7–12.2 m, S70-8. The following five lots with same data as previous: USNM 227165, 5 (15.4–19.9); ANSP 151995, 5 (13.5–22.0); BPBM 29192, 5 (14.6–20.6); CAS 52830, 5 (13.7–21.1); AMS I.24026-001, 5 (13.2–22.9). AMNH 43033, 1 (17.9); 0.5 mi. south of Passe Avapeihi, 0–1.8 m, S70-6. AMNH 43020, 2 (14.4, 19.9); ca. 2 mi. south of Fare, 0–1.8 m, S70-7. BORA BORA: AMNH 43027, 5 (12.7–19.0); lagoon channel south of Topua Is., 0–7.6 m, S70-19. AMNH 43028, 1 (13.5); ca. 2 mi. southwest of Topua Is., 0–1.8 m, S70-16. AMNH 43026, 1 (19.7); 2 mi. southwest of Topua Is., 0–1.8 m, S70-15. USNM 227167, 7 (13.5–19.3); lagoon channel south of Topua Is., 0–10.7 m, S70-18.

Non-type Material: Numerous specimens from the following localities: OCEANIA: Society Islands, Tuamotu Archipelago, Tubuai Islands, Cook Islands, Samoa Islands, Fiji, New Hebrides, Santa Cruz Islands, Solomon Islands, Gilbert Islands, Marshall Islands, Marianas Islands, Caroline Islands, Palau Islands; PAPUA NEW GUINEA; AUSTRALIA: Lord Howe Island, Great Barrier Reef; TAIWAN; PHILIPPINE ISLANDS; INDONESIA; INDIAN OCEAN: India, Sri Lanka, Chagos Archipelago, Agalega Islands, Mauritius, Seychelles Islands, Amirantes Islands, Aldabra Atoll, Comoro Islands, Mozambique.

Diagnosis.—Cephalic sensory pore system complete; pectoral fin rays numerous, modally 18, with most rays branched; dorsal/anal fin ray formula typically 9/8; elongation of spines in first dorsal fin uncommon; pelvic fin typically I, 4 1/10–

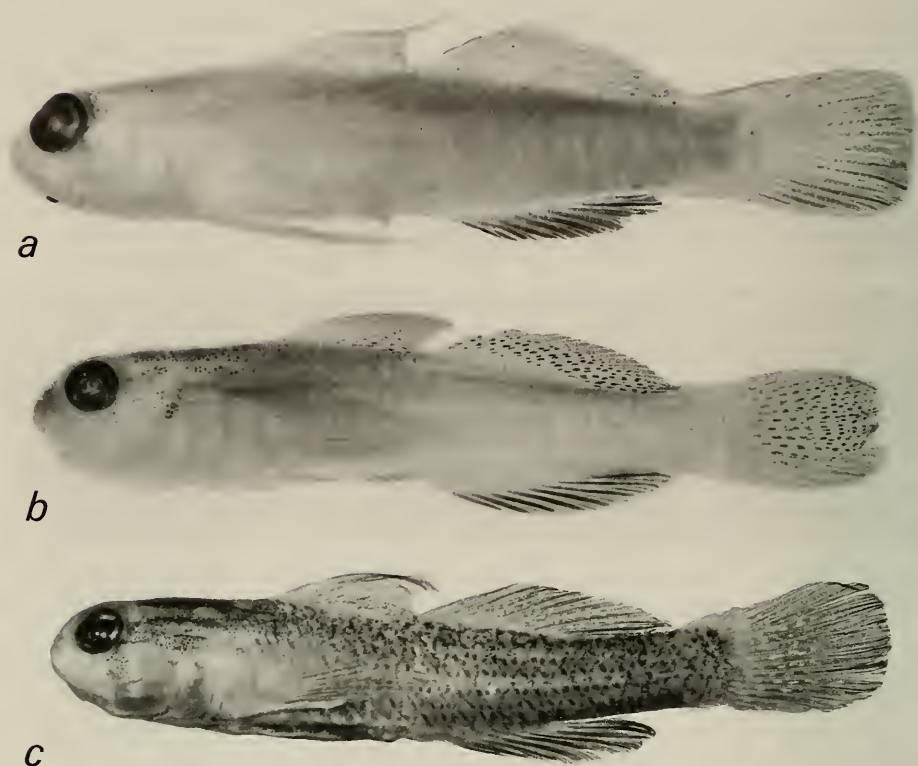


Fig. 1. *Eviota albolineata*. a, 16.4 mm SL, male, Seychelles Islands, USNM 227132; b, 20.3 mm SL, male, Tuamotu Archipelago, BPBM 14048; c, Holotype, 22.2 mm SL, male, Tahiti, USNM 227140.

2/10 with well developed membrane between rays; branches on fourth pelvic fin ray 6–12; trunk lacking both dark spot on middle portion of caudal peduncle and well developed postanal midline spots although some tiny spots or dark streaks may be present; body generally pale with dark dusky anal fin and scattered speckling on second dorsal and caudal fins; when color pattern highly developed, as in eastern Oceania populations, head with weak alternating dark and light horizontal stripes dorsolaterally and trunk moderately to distinctly dusky.

Description.—Dorsal fin VI-I, 8(1), VI-I, 9(20); anal fin I, 8(21); pectoral fin rays 16(2), 17(5), 18(7), 19(6), 20(1); pectoral fin rays 4–18 may be branched, 7–17 usually branched; pelvic fin I, 4 plus a rudiment (1), I, 4 1/10(16), I, 4 2/10(4); branches on fourth pelvic fin ray 6–12, average 8.4; segments between consecutive branches of fourth pelvic fin ray 1–4, average 2.1; pelvic fin membrane well developed; branched caudal fin rays 11(8), 12(8), 13(2), 14(1); segmented caudal fin rays 16(1), 17(20); lateral scale rows 23(4), 24(13), 25(2); transverse scale rows 6(2), 7(11); breast scaleless; vertebrae 10(13) precaudal plus 16(12), 17(1) caudal, total 26(12), 27(1).

Dorsal fin elongation uncommon, observed only in males, usually involving

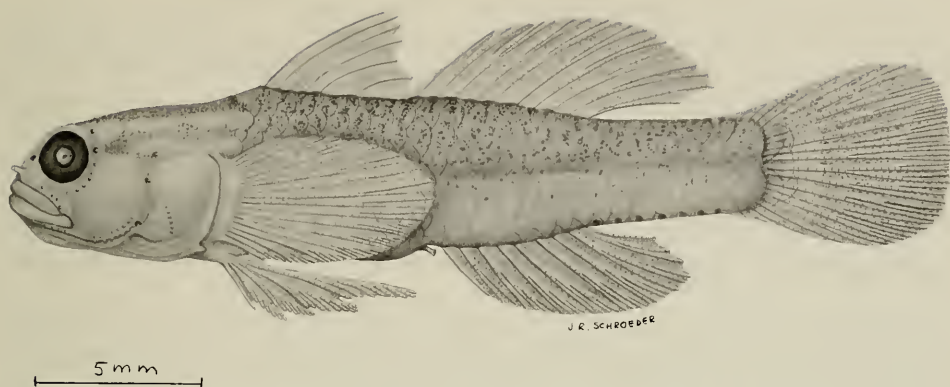


Fig. 2. *Eviota albolineata*, 22.2 mm SL, male, Moorea, Society Islands, CAS 48469.

first spine, occasionally second spine; maximum length of depressed first spine extending to end of base of second dorsal fin. Pelvic fin usually not extending beyond origin of anal fin. Cephalic sensory pore system pattern 1; cutaneous papillae system pattern A. Male genital papilla not fimbriate.

Slender species, trunk beneath spinous dorsal fin not very deep relative to depth of head and caudal peduncle. Distal margin of nonfilamentous spinous dorsal fin straight or slightly concave and approximates a vertical line perpendicular to horizontal axis of body, in contrast to a straight margin forming acute angle with horizontal axis, as in most other *Eviota*.

Color of preserved specimens.—This species is a complex of two color forms, one highly pigmented, represented in part by the type material from the Society Islands and Tuamotu Archipelago (eastern Oceania population) and a pallid form that is more widespread, occurring more to the west in Oceania, the Indo-Australian Archipelago, the Great Barrier Reef, and the Indian Ocean (western Oceania-Indian Ocean population). Within the geographic ranges of each color form are irregularly distributed intermediate color forms which are not typically clinal.

The coloration typical of the highly pigmented specimens of eastern Oceania (see Figs. 1c, 2) follows. Dorsolateral portion of head behind eyes with 2 or 3 narrow dark horizontal stripes composed of moderately dense scattered brown chromatophores, upper 2 stripes extending to anterior section of trunk, lower stripe extending to anterior portion of opercle. Lowermost dark stripe commonly obscure, other 2 varying in intensity and length. Dark stripes separated by 3 pale bands equal to or wider than stripes, upper pale band most prominent but sometimes masked by pigmentation on dorsal portion of head and nape. Pale bands often indistinct, uppermost may be limited to a large pale spot dorsolaterally behind eye at about position of supraotic pore. Striped pattern variously reduced or absent in some specimens. Head and nape dorsally variably pigmented, either with chromatophores scattered uniformly over predorsum, with weak to moderately developed saddles traversing midline, or with reticulated pattern; predorsal midline with 2 elongate spots evenly spaced between eyes and dorsal fin origin; head laterally with 3 small dusky spots, 1 at upper preopercular pore, 2 bordering margin of eye at four o'clock and two o'clock, latter at about anterior otic pore;

3 spots most apparent when dark horizontal stripes faint or absent; spot at upper preopercular pore most persistent of 3. Central portion of chin pale or rarely with small discrete spot in line with vertical through middle of eye, or with 2 to 4 small spots lateral to this position. Tip of snout and region around anterior nasal tubes dusky. Remainder of head mostly pale.

Fleshy base of pectoral fin variously pigmented with scattered chromatophores: most commonly, upper third with pale round to horizontally elongate spot more or less surrounded by faint chromatophores, or, uncommonly, with faint scattered chromatophores throughout or pale spots on both upper and lower portions of base.

Trunk often with rather uniformly scattered brown chromatophores, somewhat more dense dorsolaterally, in some specimens chromatophores absent ventrally. Dorsal portion of trunk, especially along insertions of dorsal fins, may have small clusters of chromatophores. Lateral midline of trunk with pale horizontal stripe about a half scale in width, stripe often obscure or lacking; rarely, a weak pale horizontal stripe along middorsolateral portion of trunk.

Tiny dark spots usually present along ventral midline of trunk posterior to origin of anal fin; spots number up to 14, not integrated with any subcutaneous pigment; spots sometimes joined to form variously developed elongate streaks. Subcutaneous postanal midline spots and bars and midlateral caudal peduncle spot typical of many *Eviota* absent in this species. However, subcutaneous pigmentation present in belly region as 1 to 3 large dark patches.

First dorsal fin pale to dusky, usually with some dusky pigmentation posteriorly on distal portion of membrane, and sometimes with narrow dark basal band; in some specimens, fin dusky throughout. Second dorsal and caudal fins with discrete, fine, scattered, brown chromatophores on otherwise pale membrane; in some very darkly pigmented specimens (including holotype) second dorsal and caudal fins dusky brown throughout, lacking distinct dark spots, but with discrete small pale spots interspersed over membrane. Anal fin uniformly very dark brown. Pectoral and pelvic fins usually pale except on very dark specimens where finely dusky.

Coloration of widespread pallid form (see Fig. 1a), found primarily in Indian Ocean and western Oceania, consisting of very pale head and trunk, with traces of most of diagnostic marks listed above for eastern Oceania form. Remnants of light and dark horizontal stripes on head may persist; upper pale band may be represented by pale spot near the supraotic sensory pore and lower dark stripe by narrow band of chromatophores. Three small dark spots at upper preopercular sensory pore and at the margin of the eye at two o'clock and four o'clock, usually persist. Chin usually with small dark spot on middle portion, nearly in line with vertical through eye, sometimes replaced or supplemented by 2 to 4 dark lateral spots. Predorsal midline with scattered chromatophores anteriorly, 1, or less frequently 2, elongate dark streaks mesially and weak remnants of transverse bar posteriorly. Fleshy base of pectoral fin most often pale, sometimes with weak scattered chromatophores in midsection. Trunk usually entirely pale, at most with scattered brown chromatophores on upper portion; sometimes pale midlateral band faintly discernible. Ventral midline of posterior trunk with tiny dark spots or continuous streak, as in dark color form, but intensity of pigmentation somewhat reduced; some specimens have this pigmentation segmented into 6 or fewer

elongate dark spots, but pigment never as extensive as in species of *Eviota* with well developed postanal midline spots.

First dorsal fin largely pale, distal portion with some faint scattered speckling and some specimens with weak narrow dusky basal band. Second dorsal fin pale in anterior basal region, remainder of fin pale to light dusky with fine dark spots scattered over midportion. Caudal fin pale to dusky with fine dark spots scattered over upper two-thirds of fin. Anal fin in males moderate to dark dusky throughout; in females fin may be somewhat lighter and pigmentation restricted to distal or middle portion of fin or, occasionally, lacking. Pectoral and pelvic fins pale.

The heavily pigmented color form, with well developed dark and light stripes on head, is found in the Society Islands and Tuamotu Archipelago, and is also represented by a few specimens from the Cook and Santa Cruz Islands, and the Great Barrier Reef. Specimens with only traces of this pattern are found in a wider geographic area, but occur irregularly in a non-clinal distribution. Specimens from all localities in the Indian Ocean other than Sri Lanka, and most specimens from Australia show no traces of the head stripes. When the dark stripes are not discernible the species may be recognized by the characteristic dark spots on the side of the head, by the dark anal fin, the characteristically spotted second dorsal and caudal fins, the lack of subcutaneous ventral midline trunk spots and bars, and the generally pale trunk. The single dark spot on the chin is more common in specimens from the Indian Ocean than in those from western Oceania, and is almost entirely lacking in eastern Oceania.

Color in life.—Indian Ocean color form. The following observations were made by Thomas H. Fraser at Inhaca Island, Mozambique (RUSI 1856): Specimen taken from hole in rocky substrate at base of coral head; “brilliant solid green, very conspicuous,” observed under water at distances of about 4.5–6 m.

Western Oceania color forms. The following color notes were recorded by R. Wass. Specimens taken at Tutuila Island, Samoa Islands (USNM 222522): “Body pale, edges of scales orange, yellow spot on pectoral base, yellow spots on anal base, dusky distally, orange spots on head and lips, seven orange internal blotches behind anus.” (USNM 222520): “Seven internal orange marks behind anus, body orange especially dorsally, nape with four orange saddles, lips orange, snout yellow, upper pectoral base red, trailing edges of fins dusky.” The following color was described for a specimen from Guam (UG 4324): “when live—transparent with pink and green patches along back and lower sides.”

Geographic distribution.—A widely distributed and abundant species, ranging from the east coast of Africa eastward through the Indo-Pacific region to the Tuamotu Archipelago. This species is not known from the Red Sea, Japan, and the Hawaiian Islands.

Etymology.—The specific name is a Latin combination meaning white line, in reference to the pale stripes situated laterally on the head.

Remarks.—The existence of two color forms of *Eviota albolineata* presents a systematic problem that is further compounded by the close relationship of *E. albolineata* with the allopatric species *E. guttata*. Our recognition of *E. albolineata* as a wide ranging species distinct from *E. guttata* of the Red Sea and Gulf of Oman, is based on the examination of hundreds of specimens and the appraisal of several specific color marks. Yet, we regard our interpretation of these species

as tentative because of the great differences between the pallid and the heavily pigmented forms of *E. albolineata*, and the close relationship between *E. guttata* and *E. albolineata*. A summary of the basis for our decision follows.

Eviota albolineata is a member of Group I (Lachner and Karnella 1980:113), closely resembling *E. guttata* in general color pattern and meristic characters. In addition to Group I characters these two species share the following: three spots laterally on the head, at two and four o'clock behind the eye, and one at the upper preopercular pore; a uniformly dark anal fin; small, discrete dark spots on the second dorsal and caudal fins; one or more spots on the chin; and varying amounts of speckled pigmentation on the trunk.

Eviota albolineata differs primarily from *E. guttata* in lacking the 6–7 enlarged, dark ventral midline spots and associated dark subcutaneous marks on the posterior trunk. Other differences are the pale body of the western Oceania-Indian Ocean form, the head stripes of the eastern Oceania form and the lack of a well developed dark bar along base of the spinous dorsal fin in both color forms of *E. albolineata*. There are minor differences in the pectoral fin ray counts: *E. guttata*, average 16.6 range (15–18); *E. albolineata*, Indian Ocean, 17.1 (16–18); eastern Oceania, 18.7 (18–20).

The data reported by us for color in life for the Indian Ocean color form of *E. albolineata* (Mozambique) and the western Oceania color forms (Samoa and Guam) are strikingly different, adding to the confusion in interpreting this species.

Eviota japonica, new species

Figs. 3–4

Material examined.—67 specimens from several localities in Japan and the Ryukyu Islands; total size range 10.6–24.1; gravid females 13.9–17.7.

Holotype: USNM 221758, (17.5), female; Ryukyu Is., Kohamajima Is., 9 Apr 1974, M. Hayashi and T. Itoh, sta 9, formerly YCM-P1420.

Paratypes: RYUKYU ISLANDS: YCM-P1459, 1 (17.7); Ishigakijima Is., Kabira Bay, M. Hayashi and T. Itoh. YCM-P2841, 4 (10.9–13.9); Ishigakijima Is., Kabira Bay, M. Hayashi and T. Itoh. YCM-P2615, 1 (15.0); Ishigakijima Is., Shitafukigawa River, M. Hayashi and T. Itoh. USNM 221752, 6 (10.6–16.8); N'afa Okinawa, Luchu Is., *Albatross*. JAPAN: USNM 221745, 26 (12.1–21.3); Tanegashima Is., *Albatross*. USNM 221748, 28 (11.4–24.1); Tanegashima Is., *Albatross*. FMNH 94179, 19 (9.6–20.9); Aikawa Rikuzen, *Albatross*.

Diagnosis.—Cephalic sensory pore system lacks IT pore; pectoral fin with some branched rays; dorsal/anal fin ray formula typically 9/8; spinous dorsal fin may contain filamentous spines in both sexes; pelvic fin I, 4 1/10–2/10 and with reduced membrane between rays; branches on fourth pelvic fin ray 8–16; trunk with 6 dark postanal midline spots contiguous with subcutaneous bars, last of which aligned with dark midcaudal peduncle spot; 4 narrow dark bars on belly; 2 prominent dark occipital spots in addition to many smaller and less intense spots elsewhere on head and fleshy base of pectoral fin.

Description.—Dorsal fin VI-I, 8(1), VI-I, 9(18), VI-I, 10(1); anal fin I, 8(20); pectoral fin 15(1), 16(14), 17(5); pectoral fin rays 8–17 may be branched, 11–16 usually branched; pelvic fin I, 4 1/10(19), I, 4 2/10(10); branches on fourth ray

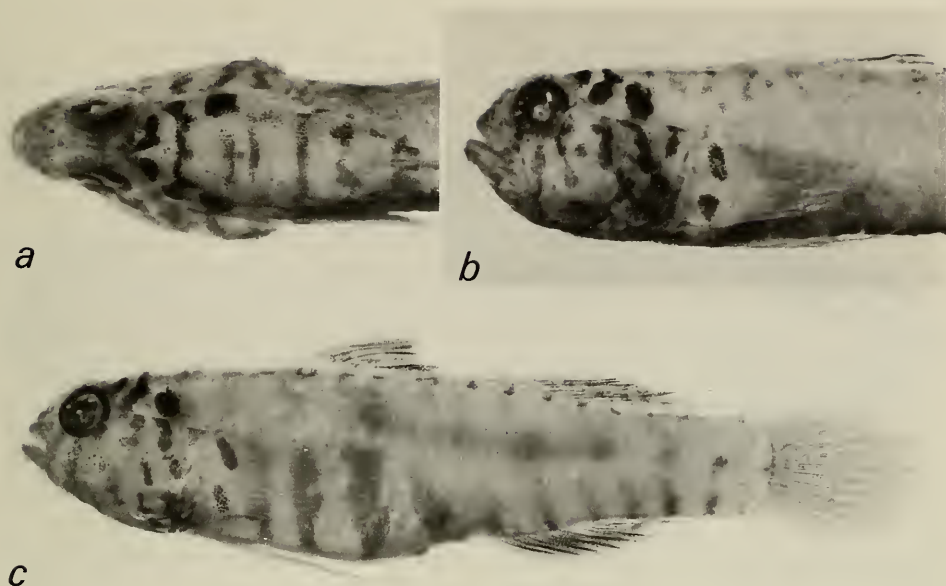


Fig. 3. *Eviota japonica*. a, b, Paratype, 21.0 mm SL, female, Aikawa Rikuzen, Japan, FMNH 94179; c, Holotype, 17.5 mm SL, female, Ryukyu Islands, USNM 221758.

of pelvic fin 8–16, average 11.2; segments between consecutive branches of the fourth pelvic fin ray 0–5, average 1.4; pelvic fin membrane reduced; branched caudal fin rays 13(5), 14(6), 15(4); segmented caudal fin rays 17(20); lateral scale rows 23(4), 24(9), 25(6); transverse scale rows 7(8), 8(7); breast scaleless; vertebrae 10(16) precaudal and 16(16) caudal, total 26.

First and second spines of spinous dorsal fin may be filamentous in both sexes, first spine longest and may extend to end of base of second dorsal fin when depressed. Pelvic fin variable in length, most often not extending to origin of anal fin, sometimes beyond. Cephalic sensory pore system pattern 2; cutaneous papillae system pattern B. Male genital papilla not fimbriate.

Color in preserved specimens.—Salient color pattern consisting of 2 prominent dark occipital spots, less intense dark spots and bars on head laterally and ventrally, 2 dark spots on fleshy base of pectoral fin, numerous small dark spots along dorsal midline, and 6 postanal ventral midline spots.

Head with 2 small dark spots on either side of dorsal midline behind eyes, followed by 2 pairs of prominent dorsolateral occipital spots; first pair almost always irregular in shape and vertically elongate, often bridged dorsally by narrow band of less dense chromatophores; second pair of occipital spots larger than first, more regular in shape, roundish to angular or triangular, and never connected to each other dorsally although sometimes a small dark spot or spots on dorsal midline midway between occipital spots; both pairs of occipital spots usually dense, dark brown, at least in lower portion of spot, dorsal portion, or in some cases whole spot, consisting of large dark chromatophores not coalesced into solid

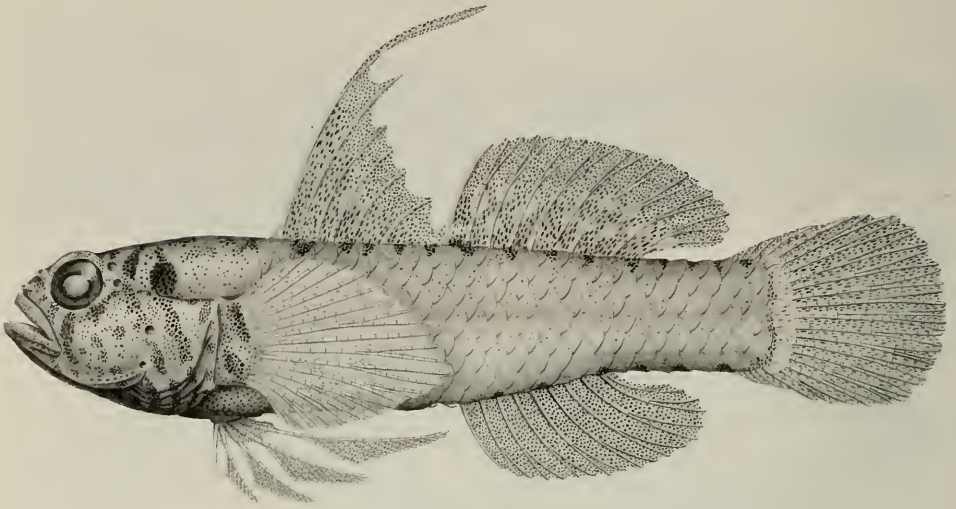


Fig. 4. *Eviota japonica*, Paratype, 18.3 mm SL, female, Tanegashima, Japan, USNM 221745.

dark pigmentation; 3 weak spots or narrow, poorly defined, transverse bars occurring along dorsal midline posterior to second pair of occipital spots; remainder of nape pale.

Cheek and opercle with irregularly shaped spots and bars, those on cheek less intense than those on opercle, but neither as dark as occipital spots; consistently present pigmentation includes elongate bar below the eye at six o'clock to below rictus, mark from eye at about seven-thirty, across lips to chin; snout weakly pigmented with small spots; lower opercle, branchiostegal membranes and lower portion of head with many small dark irregularly shaped elongate spots, equal in intensity or darker than opercle spots, sometimes approaching intensity of occipital spots.

Fleshy base of pectoral fin with 2 dark oval or elongate spots composed of loose aggregates of large dark chromatophores, spots clearly separated in midportion of base, both spots about equal in intensity to opercle spots. Dorsal midline with approximately 13–14 small dark spots or narrow bars from origin of spinous dorsal fin to procurrent rays of caudal fin. Six small, dark postanal midline spots, integrated with 6 subcutaneous bars on lower portion of trunk; upper portion of postanal trunk with 5 subcutaneous bars, third upper bar contiguous with third and fourth lower bars, last upper bar forming small, circular, entirely subcutaneous central caudal peduncle spot; upper, and to lesser extent, lower subcutaneous bars may be obscure. Four subcutaneous bars ventrolaterally on belly, not joined across ventral midline, bars narrow except in gravid females where broader in upper portion; anteriormost belly bar just posterior to pectoral fin base and lower portion of fourth bar terminating at anus; first 2 belly bars merging dorsolaterally, merged bar followed posteriorly by another dorsolateral subcutaneous bar aligned with the third lower belly bar; fourth belly bar lacking dorsal extension; 2 additional subcutaneous bars in nape region. Trunk mostly pale, faintly pigmented with fine scattered chromatophores; scale pockets usually unpigmented, rarely with fine peppery pigmentation along margins.

Dorsal fins usually uniformly pale to dark dusky although occasionally spinous dorsal fin pale with dusky bands; second dorsal fin irregularly dusky, sometimes with pale spots; anal fin uniformly moderate to dark dusky, often slightly darker than dorsal fins; caudal fin irregularly pigmented, usually pale or light dusky, sometimes with small dark spots on rays; pectoral and pelvic fins very slightly pigmented if at all.

Geographic distribution.—Known from several localities in southern Japan and the Ryukyu Islands.

Etymology.—The specific name *japonica* is based on the occurrence of this species in Japanese waters.

Remarks.—*Eviota japonica* is a member of Group II (Lachner and Karnella 1980:114) and is most closely related to *E. queenslandica* in that they share similar meristic characters, cephalic sensory pore patterns, and prominent patterns of dark spots on the head and pectoral base. They differ in the following details of the color pattern: the dark occipital spots of *E. japonica* tend to be irregular and angular in shape, and the spots on remainder of head somewhat elongate, but in *E. queenslandica* all spots are usually roundish; occipital spots of *E. japonica* are very dark, usually solid brown, at least in lower portions of spots, and usually darker than spots on cheek, opercle and sometimes pectoral base, whereas all spots in *E. queenslandica* are about equal in intensity to each other, the occipital as well as other spots composed of clusters of large, dark chromatophores rather than solid brown pigmentation; the branchiostegal membranes, lower margins of opercles, and the chin in *E. japonica* are usually heavily pigmented with elongate or angular dark marks, sometimes nearly as dark as occipital spots, but in *E. queenslandica* these areas have faint to moderate spots or scattered pigmentation, similar to the remainder of the head but less intensely pigmented; the trunk is mostly pale in *E. japonica*, at most with faint peppery chromatophores marking scale pockets, whereas the trunk in *E. queenslandica* is brownish due to heavier scale and scale pocket pigmentation; *E. japonica* has four subcutaneous bars in belly region, five subcutaneous bars above and six below on trunk posterior to anal fin origin, and with six postanal midline spots, and *E. queenslandica* has three bars or scattered chromatophores on belly region, four subcutaneous bars above and five below on posterior trunk, and with 5 postanal midline spots; the subcutaneous caudal peduncle spot in *E. japonica* is small, very faint and entirely subcutaneous whereas spot in *E. queenslandica* is small to moderate in size, somewhat more pronounced, and mostly subcutaneous, but often with a slight surface pigmentation as well.

The above color characters distinguishing these two species show no intergradation in the Ryukyu Islands where the two species are sympatric. We now report *E. queenslandica* for the first time from the Ryukyu Islands (YCM-P2523, 2 specimens, YCM-P4166, 2, YCM-P4069, 8, all from Ishigakijima Island; YCM-P2926, 2, from Taketomijima Island).

Eviota latifasciata, new species

Fig. 5

Material examined.—88 specimens from 4 localities in the western Pacific and Indian Oceans, total size range 7.7–14.7, gravid females 10.7–13.2.

Holotype: AMS I.18051-001, (12.4), female; Gilbert Islands, Abaiang Atoll, off Bolton Point, 7.6–10.7 m, 10 Nov 1973, D. F. Hoese.



Fig. 5. *Eviota latifasciata*, Paratype, 10.9 mm SL, juvenile, Abaiang Atoll, USNM 260079.

Paratypes: GILBERT ISLANDS, ABAIANG ATOLL: AMS I.18051-073, 17 (9.4–14.0); BPBM 28959, 2 (11.4, 12.9); AMNH 55062, 2 (11.2, 12.3); same data as holotype. USNM 260079, 4 (10.3–13.0); Lagoon side of Teirin Is., D. F. Hoese. AMS I.18043-001, 15 (8.4–13.8); CAS 52737, 2 (11.6, 12.4); ANSP 151949, 2 (12.4, 13.4); Lagoon off Teirin Is., 7.6 m, D. F. Hoese. CAROLINE ISLANDS: USNM 225034, 2 (11.7, 12.8); Ponape, 7°35'N, 158°11'50"E, 0–15.2 m, V. G. Springer 80-8. USNM 225033, 6 (11.1–12.6); Ponape, 7°01'59"N, 158°14'02"E, 0–4.6 m, V. G. Springer 80-11. USNM 225032, 4 (9.5–13.0); Ponape, 7°01'N, 158°19'E, 0–18.3 m, V. G. Springer 80-22. USNM 225037, 15 (7.7–12.0); Senyavin Is., Ant Atoll, 6°47'N, 157°54'24"E, 0–24.4 m, V. G. Springer 80-17.

Non-type material: 8 specimens from Christmas Island in the Indian Ocean (all WAM material); 10 specimens from Kapingamarangi Atoll, Caroline Islands, all in poor condition and faded (all CAS material).

Diagnosis.—Cephalic sensory pore system lacking IT pore; pectoral fin with some branched rays; dorsal/anal fin ray formula typically 8/8; no filamentous spines in first dorsal fin; pelvic fin typically I, 4 plus rudiment and with reduced membrane between rays; branches on fourth pelvic fin ray 7–11; body generally pale with small dark occipital spot and 4 broad dusky subcutaneous postanal trunk bars; postanal midline spots inconspicuous; large dark midcaudal peduncle spot present. Diminutive species, all specimens less than 15 mm SL.

Description.—Dorsal fin VI-I, 7(1), VI-I, 8(29), VI-I, 9(2); anal fin I, 8(30), I, 9(2); pectoral fin rays 15(2), 16(14), 17(9), 18(7); pectoral fin rays 10–18 may be branched, 11–15 usually branched; pelvic fin I, 4 plus rudiment (20), I, 4 1/10(3); branches on fourth pelvic fin ray 7–11, average 9.3; segments between consecutive branches of fourth pelvic fin ray 0–2, average 1.0; pelvic fin membrane reduced; branched caudal fin rays 11(7), 12(4); segmented caudal fin rays 17(20); lateral scale rows 23(3), 24(4), 25(1); transverse scale rows 6(6), 7(2); breast scaleless; vertebrae 10(8) precaudal plus 16(8) caudal, total 26.

Spinous dorsal fin not elongate. Pelvic fin usually extending beyond origin of anal fin. Cephalic sensory pore system pattern 2; cutaneous papillae system not completely discernible in this small species. Male genital papilla not fimbriate.

Color in preserved specimens.—Pale body, salient pigmentation consisting of small, dark occipital spot and 4 broad, dark, subcutaneous postanal trunk bars. Head mostly pale, occipital spot located laterally on head above midopercle, of

varying size and intensity, never large and pronounced. Some scattered chromatophores dorsally on head just behind eyes. Fleshy base of pectoral fin unpigmented. Trunk with 7–10 small, weak, rectangular shaped saddles over dorsum, from about middle of spinous dorsal fin posteriorly to caudal fin, better developed posteriorly, obscure in some specimens; belly with 2 broad, dusky subcutaneous patches extending dorsolaterally on trunk, and sometimes a faint subcutaneous bar dorsolaterally on nape; postanal portion of trunk with 4 broad, dusky to dark, subcutaneous bars, fourth either more intensely pigmented throughout or darker in midportion, appearing as large, dark, midcaudal peduncle spot overlying less dense subcutaneous bar. Postanal ventral midline spots inconspicuous. Spinous dorsal fin mostly pale, usually with a narrow horizontal dusky stripe basally and dusky distal margin; fin sometimes with scattered dark chromatophores throughout, never intensely dark; second dorsal fin similar to spinous dorsal fin, basal pigmentation more pronounced posteriorly. Anal fin pale to dark brown, usually darker than dorsal fin. Caudal fin pale to weakly pigmented, darker on lower half, sometimes rays with small dark spots. Pectoral and pelvic fins pale.

In specimens from Ponape and Ant Atoll the subcutaneous trunk bars are mostly obscure and in some individuals the lower portion of the third postanal bar is partially divided resulting in five bars on the lower trunk. Specimens from Kapingamarangi Atoll are very faded, showing only the occipital and caudal peduncle spots.

Geographic distribution.—This species is known from Christmas Island in the Indian Ocean, Kapingamarangi Atoll, Ant Atoll and Ponape, Caroline Islands, and from Abaiang Atoll, Gilbert Islands.

Etymology.—The specific name is formed from the Latin words *latus*, meaning broad or wide, and *fasciatus*, meaning banded, in reference to the broad subcutaneous bars on the trunk.

Remarks.—This species is a member of Group II (Lachner and Karnella 1980: 114) and can be distinguished from other members of this group by the combination of the following characters: dorsal/anal fin ray formula 8/8, no elongation of the spinous dorsal fin, a nonfimbriate male genital papilla, typically four postanal subcutaneous trunk bars, the presence of an occipital spot, and an unpigmented fleshy base of the pectoral fin. *Eviota latifasciata* shares several of the above characters with *E. bipunctata* and *E. indica* but differs from these in its coloration and reduced number of subcutaneous trunk bars.

Some variation in the pectoral fin ray count of *Eviota latifasciata* with locality was observed; Christmas Island 17(2), 18(4), Kapingamarangi Atoll 17(4), 18(3), Ponape 15(2), 16(5) and Abaiang Atoll 16(9), 17(3).

Eviota punctulata, new species

Figs. 6–7

Material examined.—255 specimens from 9 areas in Indonesia, Australia and western Oceania; total size range 7.3–23.1; gravid females 11.8–15.7.

Holotype: USNM 224550, (20.7), male; Fiji Is., Great Astrolabe Reef, reef north of Vuro Is., 8 May 1965, R. Bolin and party, *Te Vega* Exp., Cr. 7, sta 278.

Paratypes: FIJI ISLANDS: USNM 224543, 18 (18.0–23.1); same data as holotype. USNM 224542, 3 (15.5–19.9); same locality as holotype, *Te Vega* Exp.,



Fig. 6. *Eviota punctulata*, Paratype, 17.0 mm SL, male, Papua New Guinea, USNM 224548.

Cr. 7, sta 279. PAPUA NEW GUINEA: USNM 224548, 18 (11.2–18.2); Ninigo Is., 0–9.1 m, V. G. Springer 78-3. USNM 224545, 1 (13.3); Hermit Is., 0–0.9 m, V. G. Springer 78-9. USNM 224547, 7 (11.6–17.8); Hermit Is., 0–7.6 m, V. G. Springer 78-18. USNM 224549, 17 (10.8–16.1); Hermit Is., 0–12 m, V. G. Springer 78-19. CAS 47909, 5 (13.0–17.0); AMS I.22213-001, 5 (11.2–16.9); above two lots with same data as USNM 224549. USNM 224544, 1 (17.8); New Ireland, Nusa Is., 0–10 m, T. Roberts. GREAT BARRIER REEF, AUSTRALIA: Lizard Is.: AMS I.18740-107, 11 (14.8–18.0); Yonge Reef, D. F. Hoese, LZ 75-17. AMS I.18739-102, 3 (12.5–15.8); Palfrey Is., 3–10 m, D. F. Hoese, LZ 75-49. AMS I.20762-045, 1 (17.1); S. of Rocky Point, 1.5–4.6 m, D. F. Hoese 75-38. AMS I.21539-082, 1 (12.6); between Bird and South Is., 1.5–7.6 m, D. F. Hoese 75-113. AMS I.21343-008, 4 (10.1–13.8); Palfrey Is., 3 m, D. F. Hoese 75-5. USNM 224546, 4 (11.4–20.4); Palfrey Is., 2–6 m, G. Anderson and B. Russell, FT 74-2. Endeavour Reef, collected by C. L. Smith and J. Tyler: ANSP 146495, 1 (16.4); 13.7–18.3 m, TS,A-15. ANSP 146494, 4 (12.9–18.6); 7.6–18.3 m, TS,A-3. CAS 47911, 3 (11.0–18.9); 13.7–15.2 m, TS,A-16. ANSP 146492, 4 (13.2–15.3); 13.7–19.8 m, TS,A-11. AMNH 42919, 7 (11.1–22.8); 0–13.7 m, S69-16. Little Hope Island, collected by C. L. Smith and J. Tyler: AMNH 42918, 1 (15.1); S69-28. AMNH 42920, 1 (18.8), 0–4.6 m, S69-30. PHILIPPINE ISLANDS: collected by the Smithsonian BFAR, and Silliman University teams, and Alcala: CAS 47910, 3 (13.9–16.0); Palawan Prov., Bararin Is., 0–13.7 m, SP 78-20. USNM 224541, 4 (15.3–18.3); Palawan Prov., Cuyo Is., Tagauayan Is., 0–2.4 m, SP 78-25. AMS I.22209-001, 2 (15.1, 18.3); Palawan Prov., Cuyo Is., 0.6–1.2 m, SP 78-17.

Non-type material: Numerous specimens from the following general localities: INDONESIA; GREAT BARRIER REEF, AUSTRALIA; OCEANIA: Palau Islands; Kapingamarangi Atoll; Ponape Islands.

Diagnosis.—Cephalic sensory pore system lacking IT pore; pectoral fin with some branched rays; dorsal/anal fin ray formula typically 9/8; elongation of spines in first dorsal fin rare; pelvic fin I, 4 1/10–2/10 with reduced membrane between rays; branches on fourth pelvic fin ray 8–18; trunk with 6 dark postanal midline spots; head with dark, somewhat teardrop-shaped, postocular spot; midportion of fleshy base of pectoral fin with oblique streak of dusky pigmentation; scale pocket pigmentation on trunk well developed, more so posteriorly; dorsal and caudal fins with numerous prominent small dark spots.

Description.—Dorsal fin VI-I, 8(1), VI-I, 9(23), VI-I, 10(1), VII-I, 9(1); anal fin

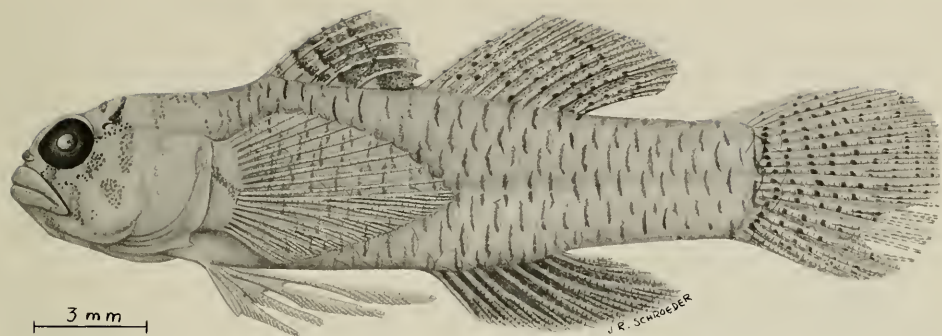


Fig. 7. *Eviota punctulata*, Holotype, 20.7 mm SL, male, Fiji Islands, USNM 224550.

I, 7(2), I, 8(24); pectoral fin 15(5), 16(16), 17(4), 18(1); pectoral fin rays 8–16 may be branched, 10–15 usually branched; pelvic fin I, 4 1/10(9), I, 4 2/10(15); branches on fourth pelvic fin ray 8–18, average 13.7; segments between consecutive branches of fourth pelvic fin ray 0–4, average 1.2; pelvic fin membrane reduced; branched caudal fin rays 12(14), 13(6), 14(2); segmented caudal fin rays 16(2), 17(24); lateral scale rows 23(7), 24(8), 25(5), 26(1); transverse scale rows 6(6), 7(13); breast scaleless; vertebrae 10(10) precaudal plus 16(10) caudal, total 26.

Spinous dorsal fin elongation rare and not well developed, only observed in males; first spine may be filamentous, and extending, when depressed, to base of fifth dorsal fin ray. Pelvic fin usually extending beyond origin of anal fin. Cephalic sensory pore system pattern 2; cutaneous papillae system pattern B. Male genital papilla not fimbriate.

Color in preserved specimens.—Salient coloration of *Eviota punctulata* consisting of dark, boldly marked scale pockets, small distinct dark spots on dorsal and caudal fins, and oblong to teardrop-shaped mark dorsolaterally on head behind upper portion of eye.

Cheek and preopercle with about 4–5 irregularly shaped patches of chromatophores, one of which always more or less vertically elongate and occurring just posterior to rictus; opercle mostly pale, faint brownish patch on upper portion; snout more or less dusky; usually faint bar from eye to upper lip at about seven o'clock; chin and branchiostegal area with faint patches of chromatophores or dusky. Dark, more or less teardrop-shaped spot dorsolaterally on head behind upper portion of eye, spot darkest ventrally; spot extending obliquely toward dorsal midline, nearly meeting contralateral mark. Two smaller dark marks anterior to these, on dorsal portion of head immediately behind eyes. Three or 4 irregular transverse bars on nape, bars meeting at midline posterior to teardrop mark; bars less intense than teardrop spot and sometimes subdivided into irregular marks.

Fleshy base of pectoral fin usually with oblique dusky mark through midlateral portion; pale areas above and below mark may be encircled by chromatophores; pectoral fin base frequently uniformly pigmented or with fine chromatophores above and below larger chromatophores in midlateral portion. Trunk characteristically pigmented with dark, vertically elongate, rather wide marks on scale pockets, these smaller on belly and most intensely pigmented posteriorly on trunk.

Belly with 3 dark, narrowly separated subcutaneous patches aligned with fainter subcutaneous patches located dorsolaterally on trunk; another dorsolateral subcutaneous patch anteriorly, on nape. Six postanal ventral midline spots, spots poorly developed and sometimes obscure, occasionally followed by weaker, smaller seventh spot near procurrent caudal rays. Six postanal spots associated with short, dark, subcutaneous bars usually faint or obscure. Seventh spot, when present, not confluent with bar although sometimes associated with very small subcutaneous marking. Upper subcutaneous trunk bars indistinct and rarely perceptible, reduced in development.

First dorsal fin variable, usually dark dusky brown on membrane, sometimes darker distally, base coloration of spines pale, spines with small dense black to brown spots: 4–5 spots occurring on first spine, spots fewer and sometimes fainter on subsequent spines, spots sometimes diffuse, indistinct or wanting; spots may be arranged in rows appearing as narrow oblique bars on fin. Membrane of second dorsal fin usually uniformly dusky brown but may be darker basally and distally, rays transparent with about 3–5 small discrete dark brown spots on each element. Caudal fin membrane dusky brown, rays mostly hyaline with about 6–8 small dark spots on each element, spots sometimes arranged to form irregular, vertically linear pattern. Anal fin uniformly dark brown, darker than second dorsal or caudal fins, equal to or slightly darker than first dorsal fin. Pectoral fin pale with very fine dark chromatophores bordering rays. Pelvic fin pale.

Sexual dichromatism not pronounced. Females tending to be frayed and paler than males; most females with less pronounced spots on fins and scale pocket markings, although in some specimens marks equal in intensity to those on males.

Geographic distribution.—This species occurs in the Java Sea and northward to the Philippine Islands, eastward to Ponape and Fiji Islands, and on the Great Barrier Reef, Australia.

Etymology.—The specific name *punctulata* is derived from the Latin word *punctum*, and is used in reference to the small dark spots on the fins.

Remarks.—*Eviota punctulata* is a member of Group II (Lachner and Karnella 1980:114) and is easily distinguished from other members of the group in having a unique color pattern, extensive branching on the fourth pelvic fin ray and little or no elongation of the spinous dorsal fin.

Eviota cometa, new species

Figs. 8–9

Material examined.—71 specimens from 4 general areas; total size range 10.3–18.5; gravid females 11.6–14.8.

Holotype: USNM 235817, 1 (15.7); Fiji Islands, Totoya Is., 18°58'57"S, 179°52'12"W, 30 m, 27 Apr 1983, V. G. Springer, VGS 82-8A.

Paratypes: FIJI ISLANDS: AMS I.24027-001, 1 (14.5); Naviti Is., 17°06'S, 177°13'E, 16.8–30 m, V. G. Springer 82-32. USNM 235832, 8 (10.3–13.7); ANSP 151996, 2 (11.7, 13.3); CAS 52831, 2 (13.2, 14.9); 18°42'S, 178°29'E, 0–39.1 m, VGS 82-25. USNM 235863, 1 (13.0); Kandavu, 19°04'S, 178°02'E, 0–13.7 m, VGS 82-22. USNM 260328, 1 (16.4); N of Vuro Is., 18°52'S, 178°30.5'E, R. Bolin.

Non-type material: Numerous specimens from four regions in the Pacific Ocean, the Ponape, Gilbert, Phoenix and Line Islands.

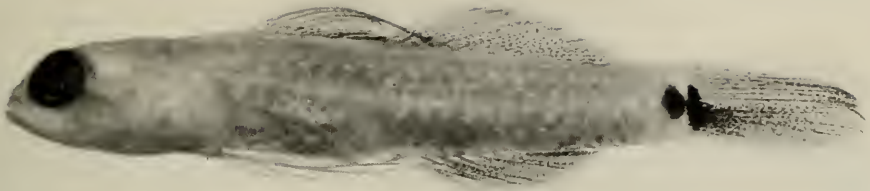


Fig. 8. *Eviota cometa*, 11.6 mm SL, male, Northern Escape Reef, Great Barrier Reef, Australia, ANSP 152010.

Diagnosis.—Cephalic sensory pore system lacking IT pore; pectoral fin rays unbranched; dorsal/anal fin ray formula usually 8/7 or 9/8; spinous dorsal fin may contain filamentous spines, uncommon in females; pelvic fin typically I, 4 1/10 with reduced to well developed membrane between rays; branches on fourth pelvic fin ray 4–9; body pale with prominent dark double mark at base of caudal fin and dark streak from mark along lower portion of caudal fin; subcutaneous bars and postanal midline spots absent in almost all specimens.

Description.—Dorsal fin VI-I, 7(1), VI-I, 8(22), VI-I, 9(21), VI-I, 10(1); anal fin I, 6(2), I, 7(21), I, 8(22); pectoral fin rays 13(1), 14(2), 15(7), 16(12), 17(4); pelvic fin I, 4 plus rudiment (3), I, 4 1/10(17), I, 4 2/10(2); branches on fourth pelvic fin ray 4–9, average 6.7; segments between consecutive branches of fourth pelvic fin ray 1–5, average 1.7; pelvic fin membrane reduced to well developed, most often reduced; branched caudal fin rays 11(14), 12(3), 13(1); segmented caudal fin rays 16(2), 17(24); lateral scale rows 21(1), 22(8), 23(2); transverse scale rows 5(7), 6(3), 7(1); breast scaleless; vertebrae 10(14) precaudal plus 15(14) caudal, total 25.

First 3 spines of spinous dorsal fin in males may be filamentous, first longest, maximum extension to midcaudal peduncle; females rarely with slight elongation of first spine. Pelvic fin almost always extending beyond origin of anal fin. Cephalic sensory pore system pattern 2; cutaneous papillae pattern not well developed in this species. Male genital papilla not fimbriate.

Color in preserved specimens.—Head and trunk mostly pale with dusky anterior nostrils, few scattered chromatophores above and behind eye, large scattered subcutaneous chromatophores on belly. Prominent dark, basicaudal mark consisting of 2 portions: roundish spot, about size of pupil, midlaterally at end of caudal peduncle, touching or nearly so, a dark, elongate, vertical mark at base of caudal rays; vertical mark extending from slightly above midline nearly to ventral margin of fin. Dark, dusky streak extending posteriorly from lower half of dark vertical mark to distal margin of fin; remainder of caudal fin mostly pale. Spinous dorsal fin with dusky band basally, otherwise pale. Second dorsal fin with dusky band basally and distally, or in large males, dusky throughout. Anal fin dusky on lower half or dusky throughout, slightly darker than other fins. Pectoral and pelvic fins pale, except in large males where they are faintly dusky.

Postanal midline of trunk pale or with many tiny subcutaneous spots, usually



Fig. 9. *Eviota cometa*, 15.6 mm SL, male, Palmyra, CAS 52852.

not forming distinct large spots; few specimens from Line Islands having 5 distinct postanal midline spots. Belly with large scattered chromatophores, lacks distinct bars or pigment patches.

In specimens from Fiji, scale pockets along ventroposterior portion of trunk weakly pigmented, pigmentation consisting of single row of chromatophores bordering each scale pocket; this pigmentation may also occur more dorsally on trunk, but less well developed.

Large male specimens having darker fins and somewhat enlarged, more diffuse, basicaudal mark. Males may also have broad faint dusky band through lower two-thirds of head and trunk; band consisting of fine, widely scattered, dark chromatophores. Males from Abaiang Atoll having enlarged basicaudal spot, anterior portion of which deeper than in other populations and nearly merging with posterior portion, latter also broader than typical. Females from Abaiang having more typically shaped mark.

Color in life.—The following description is from a color slide of a 16.1 mm SL male specimen, collected at Fanning Island, 20 Sep 1978, by P. S. Lobel (Northern Territory Museum, Australia). Body pale with reddish-brown pigmentation through most of lower portion of trunk, pigmentation beginning at eye, extending across upper cheek and opercle, over belly region where intensity greatest, terminating at end of caudal peduncle where coloration weakest; eye and anterior nostrils with some reddish pigmentation. Lower half of head with some scattered, fine, dark chromatophores. White spots within reddish-brown coloration on body: 3 or 4 spots laterally on head, 5 or 6 on belly, 6 on postanal ventral midline of trunk, those on belly most distinct, on posterior trunk most diffuse. Six elongate white spots bordering upper limit of reddish-brown coloration just above midlateral body septum. Large black basicaudal mark at hypural joint, anterior roundish part merging somewhat with posterior bar-like portion, margins of both sections diffuse. Weak dusky streak extending from lower portion of basicaudal spot horizontally through lower portion of caudal fin to distal margin of fin. Second dorsal and anal fins with slight dusky pigmentation posteriorly, otherwise pale. All other fins pale, lacking prominent pigmentation.

Geographic distribution.—This species occurs in the Great Barrier Reef, Australia, and Oceania at Fiji, Ponape and the Gilbert, Phoenix and Line Islands.

Etymology.—The specific name *cometa* is Latin for comet and is used in reference to the basicaudal spot and the trailing dark streak.

Remarks.—*Eviota cometa* is a member of Group III (Lachner and Karnella 1980:114). Of the species in this group it most closely resembles *E. zebrina*. Both species share a variable dorsal/anal fin ray formula of 8/7 or 9/8, have a pelvic fin membrane that ranges in development from reduced to well developed, and have similar prominent basicaudal spots. *Eviota cometa* differs from *E. zebrina* in lacking well developed body pigmentation, other than the basicaudal mark, and lacking vertical bars on the caudal fin. *Eviota cometa* has a dark horizontal streak on the lower portion of the caudal fin not found in specimens of *E. zebrina* from Oceania and Australia.

Eviota cometa and *E. zebrina* are sympatric at Fiji and the Great Barrier Reef. At Fiji most specimens of both species have a dorsal/anal fin ray formula of 9/8 but on the Great Barrier Reef *E. zebrina* has a formula of 9/8 and *E. cometa* 8/7.

No pattern emerges when the dorsal/anal fin ray formula of *Eviota cometa* is plotted against geographic locality. The formula varies within and between localities.

Eviota sigillata, new species

Fig. 10

Material examined.—490 specimens from several areas extending from the Indian Ocean to Oceania; total size range 9.0–21.0; gravid females 12.4–15.0.

Holotype: USNM 223836, (18.3), male; Indian Ocean, St. Brandon Shoals, south of Raphael Is., 0–3.7 m, 8 Apr 1976. V. G. Springer, VGS 76-12.

Paratypes: INDIAN OCEAN, ST. BRANDON SHOALS: USNM 223834, 31 (10.3–17.7); CAS 47938, 5 (14.0–18.1); AMS I.22205-001, 5 (13.6–18.0); ANSP 146761, 5 (13.1–16.8); BPBM 26538, 4 (14.1–18.6); WAM P.27053-001, 3 (12.0–17.7); ROM 36923, 3 (14.8–17.7). Preceding seven lots from same collection as holotype. USNM 223830, 1 (14.6); Albatross Is., 0–18.3 m, VGS 76-22. USNM 223827, 4 (15.6–19.6); N of Frigate Is., 15.2–21.3 m, VGS 76-5. USNM 223831, 29 (12.3–20.3); S of Raphael Is., 0–9.1 m, VGS 76-20. USNM 223835, 16 (9.6–19.0); southern part of Shoals, 15.2 m, VGS 76-18. USNM 223828, 25 (10.1–19.7); E of Raphael Is., 7.6–9.1 m, VGS 76-8. USNM 223833, 1 (14.4); E of Raphael Is., 0.2–1.1 m, VGS 76-7. USNM 223829, 12 (10.9–18.1); 0–2 m, VGS 76-1. USNM 223832, 7 (16.6–21.0); NE of Siren Is., 16.8–21.3 m, VGS 76-19. RUSI 1888, 2 (13.6, 16.1); W of Tortue Is., T. H. Fraser, SA-35.

Non-type material: Numerous specimens from the following general areas: INDIAN OCEAN: Seychelles Islands, Chagos Archipelago, Sri Lanka; INDONESIA; GREAT BARRIER REEF, AUSTRALIA; OCEANIA: Yap Island, Kapingamarangi Atoll, Ponape Islands.

Diagnosis.—Cephalic sensory pore system lacking IT pore; pectoral fin rays unbranched; dorsal/anal fin ray formula typically 9/8 with some geographic variation to 8/7; spinous dorsal fin may contain filamentous spines in both sexes;



Fig. 10. *Eviota sigillata*. a, 13.0 mm SL, female, Sri Lanka, USNM 223841; b, 17.4 mm SL, male, Seychelles Islands, ANSP 146506.

pelvic fin I, 4 1/10–2/10 and with well developed membrane between rays; branches on fourth pelvic fin ray 3–7; trunk with 7 dark postanal midline spots; coloration variable with age and sex: females and small males with chromatophores somewhat clustered laterally on head, 2 dark spots basally on upper and lower portions of caudal fin and additional weaker spots on fin membrane, and with dusky pigmentation basally in dorsal fins; large males, frequently more robust in body shape, having uniformly distributed chromatophores on head, more diffuse spotting on caudal fin, lower basicaudal spot more prominent, and dorsal fins with more extensive dusky pigmentation.

Description.—Dorsal fin VI-I, 8(7), VI-I, 9(23), VI-0 10(1); anal fin I, 7(7), I, 8(24); pectoral fin rays 14(1), 16(9), 17(10), 18(10), 19(1); pelvic fin I, 4 1/10(15), I, 4 2/10(16); branches on fourth pelvic fin ray 3–7, average 5.3; segments between consecutive branches of fourth pelvic fin ray 1–7, average 3.4; pelvic fin membrane well developed; branched caudal fin rays 11(21); segmented caudal fin rays 17(31); lateral scale rows 21(6), 22(4), 23(3), 24(1); transverse scale rows 5(1), 6(5); breast almost always scaleless, single embedded scale observed in one specimen; pre-caudal vertebrae 10(20), caudal vertebrae 15(19), 16(1), total 25(19), 26(1).

First 4 dorsal fin spines of males and first 3 spines of females may be filamentous, spines longer in males, when depressed, longest spine extending to procurrent caudal fin rays. Pelvic fin always extending beyond origin of anal fin. Cephalic sensory pore system pattern 2; cutaneous papillae system pattern B. Male genital papilla not fimbriate.

Some mature males may have deeper bodies than females and immature males. Head depth, at posterior margin of opercle, expressed as thousandths of the standard length, 213–234 (7 spec. 13.3–20.1 mm SL) for deep bodied or stout

males; 201–215 (6 spec., 16.3–19.7) for nonstout males; and 209–219 (6 spec. 13.4–16.0) for females.

Color in preserved specimens.—There is markedly pronounced sexual dimorphism in coloration and body depth. In mature females and nearly all small specimens of both sexes (less than approximately 13–17 mm SL), dark color laterally on head irregular and somewhat clustered, most concentrated on anterior portion of opercle, cheek pale or with few chromatophores, and snout and nostrils very dark, prominent against pale upper jaw and chin. Head dorsally and nape with few small dark spots, usually along midline, followed by series of 11 to 13 small dark spots on midline of trunk from origin of spinous dorsal fin to end of caudal peduncle, latter series faint or obscure in many specimens. Fleishy base of pectoral fin variably pigmented, often with small oblique patch of chromatophores in central portion, or with patches on upper or lower portions, base entirely pale in many specimens. Scale pockets weakly pigmented if at all, development of pigmentation mostly restricted to upper anterior portion of trunk, remainder of trunk predominantly pale. Seven small, dark, postanal midline spots integrated with 7 narrow dark vertical subcutaneous bars extending to slightly below mid-trunk, pale interspaces usually wider than dark bars; subcutaneous bars on upper trunk obscure. Two broad, oblique, dark subcutaneous patches on belly. First and second dorsal fins with dusky pigmentation basally, outer portions pale. Anal fin light dusky or pale. Caudal fin with 2 dark spots, on upper and lower basal portions, lower spot larger and more prominent; 6 to 8 smaller spots scattered over rest of fin, often weakly developed, few specimens with spots arranged in 2 or 3 wavy vertical bands; lower portion of caudal fin dusky from base to distal margin. Pectoral and pelvic fins unpigmented.

Small and some moderate sized males have pigment patterns nearly identical to females, although somewhat darker. As males mature they develop a color pattern that differs from females and all juveniles in the following ways: pigmentation laterally on head, including snout, cheek, and opercle, more or less uniformly distributed rather than clustered as on anterior portion of opercle of females and juveniles, and consisting of small evenly spaced dark brown chromatophores; upper caudal fin spot less intense and lower spot larger and more diffuse; dark basal pigmentation of spinous and second dorsal fins is broader and darker, extending to distal margins of fins in some specimens; postanal midline spots larger and more diffuse, sometimes seemingly merging with one another; dark subcutaneous bars on posterior lower trunk usually obscure.

Males also undergo dimorphism in head and body depth with maturity, evident as deepening of anterior part of body (Fig. 10b). This always correlated with mature male color pattern found in specimens that range in size from approximately 13 to 21 mm SL. Males with deep bodies much less common and usually among largest specimens in a given collection. Size at which dimorphism occurs varies among collections and with localities.

Our description of the color in preservation is based mostly on specimens from the St. Brandon Shoals. Almost all other specimens were faded to some degree and do not exhibit the full color pattern as seen on most St. Brandon Shoals specimens. The holotype is a male representing a transitional stage of color pattern between that of the juvenile and large adult male.

Color in life.—The following color description is based on a color transparency

of a 14.4 mm SL female captured in the Chagos Archipelago on March 5, 1979 by R. Winterbottom and A. R. Emery (ROM 36877). Snout, excluding upper lip, orange-red; iris golden orange-red with some white in upper portion, pupil black; head from eye to end of opercle reddish-orange, becoming light golden orange dorsally on head and nape; upper and lower jaws, chin, head below eye, and fleshy base of pectoral fin pale. The two dark oblique subcutaneous marks found on belly of preserved specimens golden-orange, separated by milky-white areas. Eleven or 12 small orange spots on trunk along dorsal midline beginning at origin of spinous dorsal fin, preceded by 3 small orange spots dorsally on head and nape. Trunk dorsolaterally, especially anteriorly, light orangish; scale pockets, above midline of body, reddish-orange. Seven subcutaneous spots and bars along ventral midline reddish-orange, lower portions of bars most intense. Two reddish-orange, vertically aligned spots, basally on upper and lower portions of caudal fin, lower spot somewhat larger. Small faint orangish spots elsewhere on caudal fin and small, milky-white spots on rays with tiny whitish spots also on membrane of lower portion of fin. First and second dorsal fins with very small faint orangish spots, basal portions with tiny milky-white spots; tiny milky-white spots also on pelvic and anal fins.

Geographic distribution.—*Eviota sigillata* is known from several localities in the Indian Ocean, a single locality in Indonesia, several localities in the northern portion of the Great Barrier Reef, Australia, and from Yap, Palau and Ponape Islands of Oceania.

Etymology.—The specific name is derived from the Latin word *sigillatus*, meaning adorned with little figures or marks, in reference to the seven dark, subcutaneous ventral midline spots.

Remarks.—This species is a member of group III (Lachner and Karnella 1980: 114) and aspects of its color pattern may resemble those of *E. storthynx* and *E. zebrina*, also of this group. *Eviota sigillata* differs from *E. storthynx* in lacking a dark, postocular spot, and differs from *E. zebrina* in having dark spots on upper and lower portions of caudal fin base, rather than a single central dark spot.

Geographic differentiation occurs in two meristic characters, the dorsal/anal fin ray formula and the number of pectoral fin rays. Specimens from the Great Barrier Reef and Indonesia have a dorsal/anal fin ray formula of 8/7(6 specimens), and have 14–17(6) pectoral fin rays, whereas specimens from the Indian Ocean and Oceania typically have a formula of 9/8 (22 of 24 specimens) and have 16–19(24) pectoral fin rays.

Eviota sparsa, new species

Figs. 11–13

Material examined.—215 specimens from 5 general areas; total size range 7.3–21.3; gravid female 15.9.

Holotype: USNM 227483, 1 (16.9), male; Samoa Islands, Tutuila Is., at Utulei village, 15.2 m, R. Wass.

Paratypes: SAMOA ISLANDS: USNM 260327, 7 (8.4–18.6); CAS 52832, 2 (14.9, 16.3); ANSP 151998, 2 (13.6, 16.9); same data as holotype. PHILIPPINE ISLANDS: Collected by Smithsonian Philippine expeditions in 1978 and 1979: USNM 227485, 1 (13.4); Palawan Prov., Cuyo Is., Cocoro Is., 0–21.3 m, SP 78-

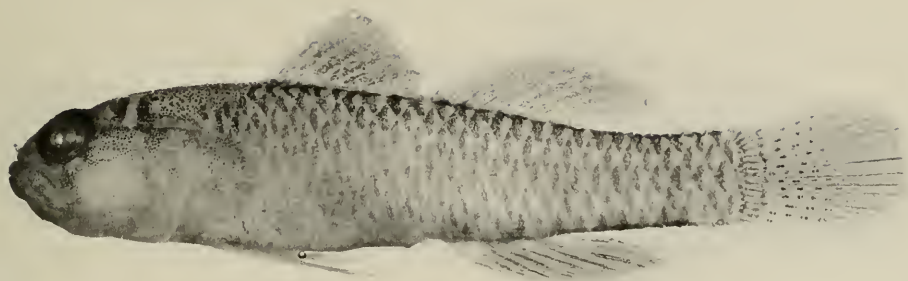


Fig. 11. *Eviota sparsa*, Holotype, 16.9 mm SL, male, Samoa Islands, USNM 227483.

27. AMS I.23987-001, 1 (17.2); Siquijor Is., 0–10.7 m, SP 78-7. AMNH 55055, 1 (16.7); Palawan Prov., Cuyo Is., Tagauayan Is., 0–13.7 m, SP 78-24. USNM 227481, 4 (15.6–17.9); Siquijor Is., 0–30.5 m, LK 79-16. INDONESIA: USNM 210070, 3 (14.2–16.6); Saparua off Kampungmahu, 13.7–16.8 m, VGS 73-12. USNM 227484, 3 (15.3–15.9); Banda Islands, VGS 74-10 or 74-11.

Non-type material: Numerous specimens from the following areas: Indonesia; Palau Islands; Great Barrier Reef, Australia.

Diagnosis.—Cephalic sensory pore system lacking IT and POP pores; pectoral fin with some branched rays; dorsal/anal fin ray formula typically 9/8; elongation of spines in first dorsal fin uncommon; pelvic fin typically I, 4 6/10–8/10 with well developed membrane between rays; branches on fourth pelvic fin ray 3–5; 5 dark postanal midline spots; body generally dusky brown; specimens from Indonesia, Philippine and Palau Islands may have prominent marks laterally on head.

Description.—Dorsal fin VI-I, 8(3), VI-I, 9(26), VI-I, 10(1); anal fin I, 7(2), I, 8(27); pectoral fin rays 14(1), 15(2), 16(13), 17(7), 18(6); pectoral fin rays 8–17 may be branched, 12–15 usually branched; pelvic fin I, 4 6/10(8), I, 4 7/10(16), I, 4 8/10(5), I, 4 9/10(1); 1 specimen in 30 with divided fifth pelvic fin ray; branches on fourth pelvic fin ray 3–5, average 4.1; segments between consecutive branches of fourth pelvic fin ray 2–8, average 4.5; pelvic fin membrane well developed; branched caudal fin rays 11(1), 12(5), 13(12), 14(2), 15(2); segmented caudal fin rays 16(1), 17(28), 18(1); lateral scale rows 23(4), 24(22), 25(3); transverse scale rows 6(10), 7(17); breast scaleless; vertebrae 10(11) precaudal plus 16(11) caudal, total 26.

Elongation of spinous dorsal fin uncommon, first 4 spines in males may be filamentous, longest spine extending to about middle of base of second dorsal fin; first 2 spines of spinous dorsal fin in females rarely slightly elongate, never filamentous. Pelvic fin usually reaching origin of anal fin or beyond. Cephalic sensory pore system pattern 5; cutaneous papillae system pattern B-1, as found in *E. storthynx* (Lachner and Karnella 1980:7). Male genital papilla not fimbriate.

Color in preserved specimens.—Body more or less uniformly dusky brown, most specimens lacking accentuated color markings. Pigmentation of head laterally ranging from scattered dark brown chromatophores to variously intense clusters



Fig. 12. *Eviota sparsa*, 15.3 mm SL, male, Northern Escape Reef, Great Barrier Reef, Australia, ANSP 148483.

of chromatophores, 2 most prominent clusters occur dorsolaterally behind eye and above preopercle. These patches more or less vertically elongate and rectangular shaped, anterior cluster smaller. Patches sometimes integrated with weaker transverse bars or spots on dorsal portion of head. These clusters usually well developed in specimens from Indonesia, Philippines and Palau Islands, moderate to weak in Samoan specimens, and weak or obscure in Australian specimens. Cheek pigmentation varying from scattered chromatophores to weak or moderately dark clusters of chromatophores; 2 to 5 clusters present, 2 of which may radiate from lower eye. Chin and snout with fine scattered chromatophores. Nape pigmentation ranging from uniformly scattered chromatophores to 2 or 3 weak, irregular transverse bars or irregular wavy clusters of chromatophores.

Fleshy base of pectoral fin with scattered chromatophores or varyingly elongate aggregations of chromatophores on lower, or lower and upper portions of base, separated by pale or less intensely pigmented area. Sometimes a weak vertical dusky band through basal portion of pectoral fin; band may be integrated with one or both elongate pigment patches. Trunk with brownish crescent shaped marks on scale pockets, marks composed of 2 or 3 rows of chromatophores; scale pocket pigmentation forms a rather uniform diamond pattern over trunk. Five somewhat



Fig. 13. *Eviota sparsa*, Paratype, 15.7 mm SL, female, Saparua, Indonesia, USNM 210070.

elongate, dark subcutaneous postanal midline spots integrated with 5 bars on posteroventral region of trunk, bars weak to moderately developed, sometimes obscure; posterodorsal portion of trunk with faint or obscure subcutaneous bars. Sixth dark ventral midline spot may occur at base of procurrent rays, often obscure. No prominent dark external or subcutaneous midcaudal peduncle spot. Belly with 3 fairly wide subcutaneous bands, first 2 extending vertically entire depth of trunk, third occurring on lower trunk only, bands usually faint to obscure.

Spinous dorsal fin most often uniform brownish but may have scattered dusky blotches or a dusky basal band. Membrane of anal and second dorsal fins uniformly light dusky, basal portions may be slightly darker, fin rays pale; some specimens with few pale circular spots on second dorsal fin; some specimens with anal fin slightly darker than dorsal fins. Caudal fin pale to light dusky, sometimes with several tiny weak dark spots on rays. Pectoral and pelvic fins pale.

Color in life.—The following color notes were recorded by Richard Wass from an undetermined specimen of the type series, collected at 15.2 meters, Utulei village, Tutuila Is., Samoa: “Background coloration pale. Posterior halves of scales covered with tiny orange and yellow spots outlined in dusky resulting in brown effect at a distance. Dorsal and caudal rays with reddish orange spots. Anal rays red. Fin membranes dusky. Three darkly pigmented (internal) areas at base of anal and three on ventral portion of caudal peduncle. Orange spots on lower lip and chin. Dusky orange spots on cheek and nape.”

Geographic distribution.—This species is known from Indonesia, the Philippines, Palau Islands, the Great Barrier Reef, and the Samoan Islands.

Etymology.—The specific name *sparsa* is a Latin word meaning sprinkled or flecked, in reference to the chromatophores scattered over the body.

Remarks.—*Eviota sparsa* is a member of Group VII. It can be distinguished from the other member of this group by the following characters: a long fifth pelvic fin ray and a uniform, unaccentuated coloration in most specimens.

Acknowledgments

We wish to extend our thanks to all those who participated in making specimens available to us on loan. In addition, we thank T. H. Fraser and R. Wass for descriptive accounts of live coloration of specimens, and R. Winterbottom, A. Emery, P. Lobel, and Helen Larson for color slides that contributed to live color descriptions. The following individuals generously allowed us to make specimen exchanges in order to distribute paratypes among major museums: J. E. Böhlke, C. L. Smith, and D. F. Hoese. Finally, special thanks go to M. Hayashi (YCM), C. L. Smith (AMNH) and R. Wass (Office of Marine Resources, Government of American Samoa), for allowing us to retain specimens from their collections as holotypes at the USNM.

The specimens illustrated in Fig. 1a and Fig. 10b were photographed by Kjell Sandved. The drawings shown in Figs. 2, 5, 7 and 9 were rendered by J. R. Schroeder, and those in Figs. 4, 12 and 13 by Paul Mazer.

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